WHAT IS CLAIMED IS:

1.   A method for reducing oxide contamination of a germanium substrate, the method comprising:

positioning the germanium substrate in a process chamber;

generating a plasma from a treatment gas, the treatment gas comprising a flow of a hydrogen-containing gas; and

providing the plasma to the process chamber to react with GeO_2 in the germanium substrate.

2.   The method recited in claim 1 wherein the plasma is generated remotely from the process chamber.

3.   The method recited in claim 1 wherein the plasma is generated in the process chamber.

4.   The method recited in claim 1 further comprising heating the germanium substrate to a temperature less than about 550°C.

5.   The method recited in claim 1 wherein the treatment gas further comprises a flow of a diluent gas.

6.   The method recited in claim 5 wherein the diluent gas comprises an inert gas.

7.   The method recited in claim 5 wherein the diluent gas comprises N_2.

8.   The method recited in claim 1 wherein the hydrogen-containing gas further contains nitrogen and does not contain silicon.

9.   The method recited in claim 1 wherein the hydrogen-containing gas comprises ammonia.

10.   The method recited in claim 1 wherein the hydrogen-containing gas comprises H_2.

11.   The method recited in claim 1 further comprising generating a plasma from a protective-layer gas that comprises a flow of a silicon-containing gas to deposit a

3 protective amorphous-silicon layer over the germanium substrate after reducing the oxide

4 contamination of the germanium substrate.

1   12. The method recited in claim 11 wherein generating the plasma from

2 the protective-layer gas comprises terminating the flow of the hydrogen-containing gas and

3 initiating the flow of the silicon-containing gas without terminating the plasma.

1   13. The method recited in claim 11 wherein generating the plasma from

2 the protective-layer gas comprises:

3   terminating the plasma from the treatment gas; and

4   thereafter, initiating the plasma from the protective-layer gas with the flow of

5 the silicon-containing gas.

1   14. The method recited in claim 11 further comprising depositing an oxide

2 layer over the protective amorphous-silicon layer.

1   15. The method recited in claim 14 wherein depositing the oxide layer is

2 performed with a plasma deposition process.

1   16. The method recited in claim 14 further comprising depositing a nitride

2 layer over the protective amorphous-silicon layer.

1   17. A method for forming an oxide layer over a germanium substrate, the

2 method comprising:

3   positioning the germanium substrate in a process chamber;

4   generating a first plasma from a treatment gas, the treatment gas comprising a

5 flow of ammonia;

6   providing the first plasma to the process chamber to react with GeO_2 in the

7 germanium substrate;

8   thereafter, generating a second plasma from a protective-layer gas that

9 comprises a flow of silane and providing the second plasma to the process chamber to deposit

10 a protective amorphous-silicon layer over the germanium substrate; and

11   thereafter, depositing the oxide layer over the protective amorphous-silicon

12 layer.

1   18.   The method recited in claim 17 further comprising heating the
2   germanium substrate to a temperature between 350 and 550 °C while providing the first
3   plasma to the process chamber.

1   19.   The method recited in claim 17 wherein the treatment gas further
2   comprises a diluent flow of an inert gas.

1   20.   The method recited in claim 17 wherein the treatment gas further
2   comprises a diluent flow of N_2.

1   21.   The method recited in claim 17 wherein generating the second plasma
2   is performed without terminating the first plasma.

1   22.   The method recited in claim 17 further comprising terminating the first
2   plasma prior to generating the second plasma.